Space Weather Forecast

Issued on Monday, 25 March 2024 at 13:11 Local

This forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: Further Minor/Moderate radio blackouts (R1/R2) expected. Current Minor solar storm conditions continuing to ease. Minor to Moderate geomagnetic storm intervals probable for next 12 to 18 hours following CME arrival 24th Mar, with a chance of a Strong geomagnetic storm interval at first.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity was moderate, with the large and complex region in the southwest producing occasional Moderate class flares through the period. Eight sunspots feature on the visible disc. This large sunspot grouping is the largest and most complex group on the disc, showing significant magnetic complexity. Changes in other sunspot groups were minor by comparison.

UK Aurora Analysis: Despite the strong recent geomagnetic activity, cloudy skies are limiting aurora sightings, with none confirmed at time of writing.
No further significant Earth-directed Coronal Mass Ejections (CMEs) observed on available imagery over the last 24hr.

Solar Wind / Geomagnetic Activity: The solar wind was initially at elevated levels (520 km/s), before s complex CME arrived at the observation satellites at L1 at 24/1410UTC at which point solar winds jumped to strong-very strong speeds (750-850 km/s) where they have remained since. The magnetic field was initially weak to moderate but jumped to strong values from the CME arrival, briefly touching very strong. The all-important north-south component became strongly negative from CME impact until 25/1548UTC, then soon became largely strongly positive.
The net result of the above solar wind measures was initially Unsettled to Active activity then moderate geomagnetic storm conditions were observed following the CME arrival, peaking at severe geomagnetic storm from 24/1500UTC, falling to a strong storm at 24/1800UTC and then generally Active to minor storm from 24/2100UTC.

Energetic Particles / Solar Radiation: Solar radiation was at S1 levels and have been on a slow and steady decline.

Four-Day Space Weather Forecast Summary

Solar Activity: Moderate solar activity is expected, with further Moderate flares expected from primarily the large and highly active region through the forecast period, with a chance of isolated Strong flares.

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Solar Wind / Geomagnetic Activity: A coronal mass ejection (CME) associated with the strong flare on the 23rd March arrived at L1 at 24/1410UTC. Combined with a high speed stream, this is currently giving strong solar wind speeds. There are no other Earth directed CMEs in the forecast.
Solar winds at strong levels at first on Day 1 (25 Mar) with a slow and steady decline over the coming days. Solar winds are expected to reduce towards slightly elevated by Day 4 (28 Mar).

Initially geomagnetic activity starting at Active levels with further minor to moderate storm conditions probable and a chance of strong geomagnetic storm for the next 12 to 18 hours. By day 2 and 3 (26 and 27 Mar) the risk of geomagnetic storm conditions reduces with a a return to generally Quiet to unsettled conditions probable by the end of the period in the absence of any further CME enhancements.

Energetic Particles / Solar Radiation: High energy proton flux, as observed by GOES18 is now at minor storm levels. The decline is expected to continue and probably falling back to background levels by day 2 (26 Mar), although confidence is reasonably low given the number of different factors as well as the dominant sunspot group making continued progress westward through this four-day period to gradually increase the risk of further enhancement in association with significant flaring.

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Geomagnetic Storms:

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	Yes	70	60	40	20
Strong	G3	Yes	20	20	10	1
Severe	G4	Yes	1	1	1	1
Extreme	G5	No	1	1	1	1

Radio Blackouts - X Ray Flares:

X Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	R1-R2 M Class	Yes	90	90	90	90
Very Active	R3 to R5 X	No	30	30	30	30

Solar Radiation Storms - (High Energy Protons):

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	≥ S1	Yes	100	70	40	30
Very Active	≥ S3 *	No	5	5	5	5

* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)

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